

Listing of Claims:

1. (Currently Amended) An optical communications apparatus, comprising:
an optical bench comprising a substrate having an electrical turning via formed therein;
an optoelectronic (OE) chip; and
an integrated circuit (IC) chip,
wherein the OE chip and IC chip are mounted on the optical bench and electrically connected using the electrical turning via, and
wherein the electrical turning via comprises at least one 90 degree bend.
2. (Original) The apparatus of claim 1, wherein the OE chip comprises a vertical-cavity surface-emitting laser bar (VCSEL).
3. (Original) The apparatus of claim 1, wherein the IC chip comprises a laser driver.
4. (Original) The apparatus of claim 1, wherein the OE chip comprises a photodetector array.
5. (Original) The apparatus of claim 1, wherein the IC chip comprises an amplifier.
6. (Original) The apparatus of claim 1, wherein the apparatus comprises an OE receiver package, an OE transmitter package, or an OE transceiver package.
7. (Original) The apparatus of claim 1, wherein the substrate comprises a silicon substrate.
8. (Original) The apparatus of claim 1, further comprising an optical transmission line mounted or formed on the optical bench.

9. (Original) The apparatus of claim 8, wherein the OE chip and optical transmission line are disposed on the optical bench such that a center axis of the optical transmission line is substantially perpendicular to a light-emitting or light receiving surface of the OE chip.

10. (Original) The apparatus of claim 8, wherein the optical bench comprises an alignment mark etched in the substrate for aligning the OE chip to the optical transmission line.

11. (Original) The apparatus of claim 10, wherein the OE chip comprises an alignment mark that matches the etched alignment mark in the substrate.

12. (Original) The apparatus of claim 8 wherein the optical transmission line comprises an optical fiber mounted on the optical bench.

13. (Original) The apparatus of claim 8, wherein the optical transmission line comprises a waveguide structure formed on a surface of the substrate.

14. (Original) The apparatus of claim 1, wherein the optical bench further comprises a v-groove channel etched in the substrate for mounting an optical fiber, and an alignment mark that is co-etched with the v-groove channel.

15. (Original) The apparatus of claim 1, wherein the OE chip comprises a ledge structure on a surface thereof for providing push-stop alignment when mounted on the optical bench.

16. (Original) The apparatus of claim 15, wherein the optical bench further comprises an etched cavity for mountably receiving the OE chip, the etched cavity comprising a step structure that contacts the ledge structure of the OE chip.

17. (Original) The apparatus of claim 1, wherein the electrical turning via is terminated with solder bumps.

18. (Canceled)

19. (Currently Amended) ~~The apparatus of claim 1, An optical communications apparatus, comprising:~~

an optical bench comprising a substrate having an electrical turning via formed therein;

an optoelectronic (OE) chip; and

an integrated circuit (IC) chip,

wherein the OE chip and IC chip are mounted on the optical bench and electrically connected using the electrical turning via, and

wherein the electrical turning via has a first end portion exposed on a first surface of the substrate and a second end portion exposed on a second surface of the substrate, the first and second surfaces defining planes that are substantially perpendicular.

20. (Currently Amended) ~~The apparatus of claim 1, An optical communications apparatus, comprising:~~

an optical bench comprising a substrate having an electrical turning via formed therein;

an optoelectronic (OE) chip; and

an integrated circuit (IC) chip,

wherein the OE chip and IC chip are mounted on the optical bench and electrically connected using the electrical turning via, and

wherein the OE chip and IC chip are mounted on the optical bench such that a light-emitting or light-detecting surface of the OE chip is substantially perpendicular to a surface of the IC chip having contacts.

21. ~ 36 (Canceled)

37. (New) The apparatus of claim 19, wherein the OE chip comprises a vertical-cavity surface-emitting laser bar (VCSEL).

38. (New) The apparatus of claim 19, wherein the IC chip comprises a laser driver.

39. (New) The apparatus of claim 19, wherein the OE chip comprises a photodetector array.

40. (New) The apparatus of claim 19, wherein the IC chip comprises an amplifier.

41. (New) The apparatus of claim 19, wherein the apparatus comprises an OE receiver package, an OE transmitter package, or an OE transceiver package.

42. (New) The apparatus of claim 19, further comprising an optical transmission line mounted or formed on the optical bench.

43. (New) The apparatus of claim 42, wherein the OE chip and optical transmission line are disposed on the optical bench such that a center axis of the optical transmission line is substantially perpendicular to a light-emitting or light receiving surface of the OE chip.

44. (New) The apparatus of claim 20, wherein the OE chip comprises a vertical-cavity surface-emitting laser bar (VCSEL).

45. (New) The apparatus of claim 20, wherein the IC chip comprises a laser driver.

46. (New) The apparatus of claim 20, wherein the OE chip comprises a photodetector array.

47. (New) The apparatus of claim 20, wherein the IC chip comprises an amplifier.

48. (New) The apparatus of claim 20, wherein the apparatus comprises an OE receiver package, an OE transmitter package, or an OE transceiver package.

49. (New) The apparatus of claim 20, further comprising an optical transmission line mounted or formed on the optical bench.

50. (New) The apparatus of claim 49, wherein the OE chip and optical transmission line are disposed on the optical bench such that a center axis of the optical transmission line is substantially perpendicular to a light-emitting or light receiving surface of the OE chip.

51. (New) An optical communications apparatus, comprising:
an optical bench comprising a substrate having an electrical turning via formed therein;
an optoelectronic (OE) chip; and
an integrated circuit (IC) chip,
wherein the OE chip and IC chip are mounted on the optical bench and electrically connected using the electrical turning via, and
wherein the OE chip comprises a ledge structure on a surface thereof for providing push-stop alignment when mounted on the optical bench.

52. (New) The apparatus of claim 51, wherein the optical bench further comprises an etched cavity for mountably receiving the OE chip, the etched cavity comprising a step structure that contacts the ledge structure of the OE chip.